

March 20, 2020

Mr. Aram Varjabedian
Woodard & Curran
Hull Water Pollution Control Facility
1111 Nantasket Avenue
Hull, Massachusetts 02045

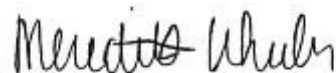
Dear Mr. Varjabedian:

Enclosed, please find a copy of our report presenting the results of toxicity tests completed using an effluent sample collected from the Hull, Massachusetts Water Pollution Control Facility during February 2020. Acute toxicity was evaluated using the inland silverside minnow, *Menidia beryllina*.

Please do not hesitate to call me should you have any questions regarding the report.

Sincerely,

Enthalpy Analytical, LLC



Meredith Wheeler
Project Manager

Enclosure:

WET Test Report Certification
Report Number 32699-20-02
Email Only

WHOLE EFFLUENT TOXICITY TEST REPORT CERTIFICATION

Permittee Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on: _____

Authorized Signature

Print or Type Name

Hull Permanent Sewer Commission

Print or Type the Permittee's Name

MA0101231

Type or Print the NPDES Permit No.

WHOLE EFFLUENT TOXICITY TEST REPORT CERTIFICATION (Bioassay Laboratory)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on: March 20, 2020



Kirk Cram
Laboratory Director - Enthalpy Analytical, LLC



**TOXICOLOGICAL EVALUATION
OF A TREATED INDUSTRIAL EFFLUENT
BIOMONITORING SUPPORT FOR A NPDES PERMIT:
February 2020**

Hull Water Pollution Control Facility
Hull, Massachusetts
NPDES Permit Number MA0101231

Prepared For:

Woodard and Curran
Hull Water Pollution Control Facility
1111 Nantasket Avenue
Hull, Massachusetts 02045

Prepared By:

Enthalpy Analytical, LLC
One Lafayette Road
Hampton, New Hampshire 03842

February 2020
Reference Number: Hull32699-20-02

STUDY NUMBER 32699

EXECUTIVE SUMMARY

The following summarizes the results of acute exposure bioassays completed during February 2020 in support of the NPDES biomonitoring requirements of the Hull, Massachusetts Water Pollution Control Facility operated by Woodard and Curran. The 48-hour acute definitive assay was conducted using the inland silverside, *Menidia beryllina*.

M. beryllina, supplied by Aquatic Research Organisms (ARO) of Hampton, New Hampshire, were 11 days old at the start of the test. Dilution water was receiving water collected from the Massachusetts Bay upstream of, or away from, the discharge. Samples were received under chain of custody in good order. All sample receipt, test conditions and control endpoints were within protocol specifications, except where otherwise noted.

The results presented in this report relate only to the samples described on the chain(s) of custody and sample receipt log(s), and are intended to be used only by the submitter. Results from the acute exposure assays and their relationship to permit limits are summarized in the following matrix.

Acute Toxicity Evaluation

| Species | Exposure | LC-50 | A-NOEC | Permit Limit (LC-50) | Effluent Meets Permit Limit | Assay Meets Protocol Limits |
|--------------------------|----------|-------|--------|-------------------------|--------------------------------|--------------------------------|
| <i>Menidia beryllina</i> | 48 Hours | >100% | NC | ≥100% | Yes | Yes |

COMMENTS:

NC = Not Calculated.

**TOXICOLOGICAL EVALUATION
OF A TREATED INDUSTRIAL EFFLUENT
BIOMONITORING SUPPORT FOR A NPDES PERMIT:
February 2020**

Hull Water Pollution Control Facility
Hull, Massachusetts
NPDES Permit Number MA0101231

1.0 INTRODUCTION

This report presents the results of an acute toxicity test completed on a composite effluent sample collected from the Hull, Massachusetts Water Pollution Control Facility (Hull WPCF) operated by Woodard and Curran. Testing was based on programs and protocols developed by the US EPA (2002), with exceptions as noted by US EPA Region I (2012), and involved conducting a 48-hour static acute toxicity test with the inland silverside minnow, *Menidia beryllina*. Testing was performed at Enthalpy Analytical, LLC (Enthalpy), Hampton, New Hampshire in accordance with the provisions of TNI Standards (2009).

Acute toxicity tests involve preparing a series of concentrations by diluting effluent with control water. Groups of test organisms are exposed to each effluent concentration and a control for a specified period. In acute tests, mortality data for each concentration are used to calculate the median lethal concentration, or LC-50, defined as the effluent concentration that kills half of the test organisms. Samples with high LC-50 values are less likely to cause significant environmental impacts. The no-effect concentration is also determined to provide information about the level of effluent that would have minimal acute effects in the environment. This Acute No Observed Effect Concentration (A-NOEC) is defined as the highest tested effluent concentration that causes no significant mortality.

2.0 MATERIALS AND METHODS

2.1 General Methods

Toxicological and analytical protocols used in this program follow procedures primarily designed to provide standard approaches for the evaluation of toxicological effects of discharges on aquatic organisms (US EPA 2002), and for the analysis of water samples (APHA 2012). See Section 4.0 for a list of references.

2.2 Test Species

When necessary, *M. beryllina* was acclimated to approximate test conditions prior to use in the assay. Test organisms were transferred to test chambers using an inverted glass pipet, minimizing the amount of water added to test solutions. Twenty control fish were weighed during the test to confirm loading rates. The loading rate was below the maximum 0.4 g/L recommended for assays conducted at 25°C. Fish weights and loading calculations are included in Appendix A.

2.3 Effluent and Laboratory Water

Effluent collection information is provided in Table 1. Samples were received at 0-6°C as per 40 CFR §136.3 unless otherwise noted, stored at 4±2°C and warmed to 25±1°C prior to preparing test solutions. Effluent used in the *M. beryllina* assay was salinity adjusted to 25±2 ppt using artificial sea salts according to protocol (US EPA 2002). Laboratory water was collected from the Hampton/Seabrook Estuary. This water has been used to culture marine test organisms since 1981.

Total residual chlorine (TRC) was measured by amperometric titration (MDL 0.02 mg/L) in the effluent and diluent samples prior to use in the assays. Samples with ≥0.02 mg/L TRC were dechlorinated using sodium thiosulfate (US EPA 2002) and a control treatment using laboratory water adjusted with the same amount of sodium thiosulfate used to dechlorinate the effluent was run concurrently with the assay. If sample pH measured <6.0 SU or >9.0 SU, samples were adjusted using sodium hydroxide or hydrochloric acid, respectively, and a control treatment using laboratory water adjusted with the same amount of either

compound used to modify sample pH was run concurrently with the assay. When applicable, data from sodium thiosulfate and/or pH adjusted laboratory control treatments can be found in Appendix A.

2.4 Acute Exposure Bioassay

Test concentrations for the assay were 100%, 50%, 25%, 12.5%, and 6.25% effluent. The 48-hour static acute toxicity test was conducted at $25\pm 1^{\circ}\text{C}$ with a photoperiod of 16:8 hours light:dark. Test chambers were 250 mL glass beakers containing 200 mL test solution in each of 4 replicates with 10 organisms/replicate. Replicates were not randomized during testing; rather, organisms were added randomly at test initiation by replicate across test solutions in an alternating fashion (alternating allocation). Survival and dissolved oxygen were recorded daily in all replicates. Salinity, temperature, and pH were measured daily in one replicate of each test treatment.

2.5 Data Analysis

When applicable, statistical analysis of acute exposure data was completed using CETIS™ v1.9.6.3, Comprehensive Environmental Toxicity Information System, software. The program computes acute exposure endpoints based on US EPA decision tree guidelines specified in individual test methods. If survival in the highest test concentration is >50%, the LC-50 is obtained by direct observation of the raw data. As needed, the A-NOEC is determined as the highest test concentration that caused no significant mortality.

2.6 Quality Control

As part of the laboratory quality control program, standard reference toxicant assays are completed on a regular basis for each test species. These results provide relative health and response data while allowing for comparison with historic data sets. See Table 2 for details.

3.0 RESULTS AND DISCUSSION

Results of the acute exposure bioassay completed using the inland silverside are summarized in Table 3. Effluent and dilution water characteristics are presented in Table 4. US EPA Region I toxicity test summary sheets can be found after the tables. Support data, including copies of laboratory bench sheets, are included in Appendix A.

Minimum test acceptability criteria require $\geq 90\%$ survival in the control concentrations. Achievement of these results indicates that healthy test organisms were used and that the dilution water had no significant adverse impact on the outcome of the assay. See the Executive Summary and Table 3 for test acceptability.

4.0 LITERATURE CITED

40 CFR §136.3. *Code of Federal Regulations* (CFR), Protection of the Environment (Title 40), Guidelines Establishing Test Procedures for the Analysis of Pollutants (Part 136), Identification of Test Procedures (sub-part 3), Table II-Required Containers, Preservation Techniques, and Holding Times.

APHA. 2012. *Standard Methods for the Examination of Water and Wastewater*, 22nd Edition. Washington D.C.

The NELAC Institute (TNI). 2009. *Environmental Laboratory Sector, Volume 1: Management and Technical Requirements for Laboratories Performing Environmental Analysis (TNI Standard)*. EL-V1-2009.
US EPA 2002. *Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms*. Fifth Edition. EPA-821-R-02-012.

US EPA Region I. 2012. *Marine Acute Toxicity Test Procedure and Protocol*. US EPA Region I Office, Boston, Massachusetts. August 2012.

TABLE 1. Sample Collection Information.
Hull WPCF Effluent Biomonitoring Evaluation. February 2020.

| Sample Description | Type | Collection | | Receipt | | Receipt Temp °C |
|--------------------|------|-------------|-----------|----------|------|-----------------|
| | | Date | Time | Date | Time | |
| Effluent | Comp | 02/04-05/20 | 0800-0800 | 02/05/20 | 1100 | 3 |
| Receiving Water | Grab | 02/05/20 | 0600 | 02/05/20 | 1100 | 3 |

TABLE 2. Reference Toxicant Data.
Hull WPCF Effluent Biomonitoring Evaluation. February 2020.

| Date | Organism Lot | Endpoint | Value | Historic Mean/ Tendency | Acceptable Range | Reference Toxicant |
|---------------------|---------------|---------------------|-------|----------------------------|------------------|--------------------|
| <i>M. beryllina</i> | | | | | | |
| 02/27/20 | 09MbABS022520 | Survival 48Hr LC-50 | 35.7 | 64.2 | 22.8 – 106 | Ammonia (mg/L) |

Means and Acceptable Ranges based on the 20 most recent reference toxicant assays.

TABLE 3. Acute Evaluation Results.
Hull WPCF Effluent Biomonitoring Evaluation. February 2020.

| | | | Percent Survival | | | | | |
|--------------------------|----------|-----------------|----------------------|--------------------|--------|-------|-------|-------|
| Species | Exposure | Lab | RW | 6.25% | 12.5% | 25% | 50% | 100% |
| <i>M. beryllina</i> | 48 hours | 92.5% | 92.5% | 97.5% | 92.5% | 97.5% | 97.5% | 92.5% |
| LC-50 and A-NOEC Results | | | | | | | | |
| Species | Exposure | Spearman-Karber | Linear Interpolation | Direct Observation | A-NOEC | | | |
| <i>M. beryllina</i> | 48 Hours | NC | NC | >100% | NC | | | |

COMMENTS:
 NC = Not Calculated.

**TABLE 4. Effluent and Diluent Characteristics.
Hull WPCF Effluent Biomonitoring Evaluation. February 2020.**

| PARAMETER | UNIT | EFFLUENT | RECEIVING WATER |
|-------------------------|------|----------|-----------------|
| pH - As Received | SU | 6.83 | 7.78 |
| Salinity - As Received | ppt | 6 | 31 |
| Total Residual Chlorine | mg/L | <0.02 | <0.02 |
| Total Solids | mg/L | 6700 | 34000 |
| Total Suspended Solids | mg/L | 4.5 | 11 |
| Ammonia as N | mg/L | 1.36 | 0.16 |
| Total Organic Carbon | mg/L | 9.3 | 1.4 |
| Aluminum, total | mg/L | 0.02 | 0.022 |
| Cadmium, total | mg/L | <0.0003 | <0.0005 |
| Calcium, total | mg/L | 108 | 403 |
| Chromium, total | mg/L | <0.001 | <0.002 |
| Copper, total | mg/L | 0.015 | 0.0019 |
| Lead, total | mg/L | <0.0003 | <0.0005 |
| Magnesium, total | mg/L | 235 | 1200 |
| Nickel, total | mg/L | 0.0034 | <0.002 |
| Zinc, total | mg/L | 0.1 | 0.007 |

COMMENTS:

Additional water quality and chemistry data are available in Appendix A.

TOXICITY TEST SUMMARY SHEET

| | | | |
|-------------------|-----------|------------------|----------|
| FACILITY NAME: | Hull WPCF | TEST START DATE: | 02/06/20 |
| NPDES PERMIT NO.: | MA0101231 | TEST END DATE: | 02/08/20 |

| TEST TYPE | TEST SPECIES | SAMPLE TYPE | SAMPLE METHOD |
|---|--|---|---|
| <input checked="" type="checkbox"/> Acute | <input type="checkbox"/> <i>Pimephales promelas</i> | <input type="checkbox"/> Prechlorinated | <input type="checkbox"/> Grab |
| <input type="checkbox"/> Chronic | <input type="checkbox"/> <i>Ceriodaphnia dubia</i> | <input type="checkbox"/> Dechlorinated | <input checked="" type="checkbox"/> Composite |
| <input type="checkbox"/> Modified Chronic (Reporting Acute Values) | <input type="checkbox"/> <i>Daphnia pulex</i> | <input type="checkbox"/> Chlorine Spiked in Lab | <input type="checkbox"/> Flow-thru |
| | <input type="checkbox"/> <i>Americamysis bahia</i> | <input type="checkbox"/> Chlorinated on Site | <input type="checkbox"/> Other |
| | <input type="checkbox"/> <i>Cyprinodon variegatus</i> | <input type="checkbox"/> Unchlorinated | |
| <input type="checkbox"/> 24 Hour Screen | <input checked="" type="checkbox"/> <i>Menidia beryllina</i> | <input checked="" type="checkbox"/> No Detectable Chlorine Upon Receipt | |
| | <input type="checkbox"/> <i>Arbacia punctulata</i> | | |

DILUTION WATER:

☒ Receiving water collected at a point upstream or away from the discharge, free from toxicity or other sources of contamination; Receiving Water Name: Massachusetts Bay

☐ Alternate surface water of known quality and hardness, to generally reflect the characteristics of the receiving water; Receiving Water Name: _____

☐ Synthetic water prepared using either Millipore Milli-Q or equivalent deionized water and reagent grade chemicals; or deionized water combined with mineral water.

☐ Artificial sea salts mixed with deionized water

☐ Deionized water and hypersaline brine

☐ Other

EFFLUENT SAMPLING DATES:

02/04-05/20

EFFLUENT CONCENTRATIONS TESTED (%):

100%, 50%, 25%, 12.5%, 6.25%

Permit Limit Concentration: ≥100 %

Was the effluent salinity adjusted? Yes If yes, to what level? 25 ppt

REFERENCE TOXICANT TEST DATE:

02/27/20 LC-50: 35.7 mg/L Ammonia

PERMIT LIMITS AND TEST RESULTS

Test Acceptability Criteria

Mean Diluent Control Survival: 92.5 %

LIMITS

LC-50: ≥100 %

A-NOEC: - %

IC- - %

RESULTS

LC-50 >100 %

Upper Limit: - %

Lower Limit: - %

Method: Direct Observation

A-NOEC - %

IC- - %

APPENDIX A
DATA SHEETS
STATISTICAL SUPPORT

| Contents | Number of Pages |
|--|----------------------------|
| Methods Used in NPDES Permit Biomonitoring Testing | 1 |
| Massachusetts DEP Accreditation Certification and Certified Parameter List | 2 |
| <i>M. beryllina</i> Acute Bioassay Bench Sheets | 2 |
| <i>M. beryllina</i> Reference Toxicant Analysis | 1 |
| <i>M. beryllina</i> Wet Weights | 1 |
| <i>M. beryllina</i> Organism Culture Sheet | 1 |
| Preparation of Dilutions and Record of Meters Used | 1 |
| Analytical Chemistry Report | 1 |
| Sample Receipt Record | 1 |
| Chain of Custody | 1 |
| Assay Review Checklist | 1 |
| Total Appendix Pages | 13 |

METHODS USED IN NPDES PERMIT BIOMONITORING TESTING

| Parameter | Method |
|------------------------------------|---|
| Acute Exposure Bioassays: | |
| <i>Ceriodaphnia dubia</i> | EPA-821-R-02-012 2002.0 |
| <i>Daphnia pulex</i> | EPA-821-R-02-012 2021.0 |
| <i>Pimephales promelas</i> | EPA-821-R-02-012 2000.0 |
| <i>Americamysis bahia</i> | EPA-821-R-02-012 2007.0 |
| <i>Menidia beryllina</i> | EPA-821-R-02-012 2006.0 |
| <i>Cyprinodon variegatus</i> | EPA-821-R-02-012 2004.0 |
| Chronic Exposure Bioassays: | |
| <i>Ceriodaphnia dubia</i> | EPA-821-R-02-013 1002.0 |
| <i>Pimephales promelas</i> | EPA-821-R-02-013 1000.0 |
| <i>Cyprinodon variegatus</i> | EPA-821-R-02-014 1004.0 |
| <i>Menidia beryllina</i> | EPA-821-R-02-014 1006.0 |
| <i>Arbacia punctulata</i> | EPA-821-R-02-014 1008.0 |
| <i>Champia parvula</i> | EPA-821-R-02-014 1009.0 |
| Trace Metals: | |
| Trace Metals | EPA 200.8/SW 6020, EPA 245.7 |
| Hardness | EPA SW846 3rd Ed. 6010 |
| Wet Chemistries: | |
| Alkalinity | EPA 310.2 |
| Chlorine, Residual | Standard Methods 22 nd Edition - Method 4500-Cl D |
| Total Organic Carbon | Standard Methods 22 nd Edition - Method 5310 C |
| Specific Conductance | Standard Methods 22 nd Edition - Method 2510 B |
| Nitrogen - Ammonia | Standard Methods 22 nd Edition - Method 4500-NH ₃ G |
| pH | Standard Methods 22 nd Edition - Method 4500-H+ B |
| Solids, Total (TS) | Standard Methods 22 nd Edition - Method 2540 B |
| Solids, Total Dissolved (TDS) | Standard Methods 22 nd Edition - Method 2540 C |
| Solids, Total Suspended (TSS) | Standard Methods 22 nd Edition - Method 2540 D |
| Dissolved Oxygen | Standard Methods 22 nd Edition - Method 4500-O G |

Please visit our web site at www.enthalpy.com/accreditations for a copy of our accreditations and state certifications.

The Commonwealth of Massachusetts



Department of Environmental Protection

Division of Environmental Laboratory Sciences

Senator William X. Wall Experiment Station

certifies

M-NH906

ENTHALPY ANALYTICAL, LLC
1 LAFAYETTE RD
HAMPTON, NH 03842-0000

Laboratory Director: JASON HOBBS

for the analysis of NON POTABLE WATER (CHEMISTRY)

pursuant to 310 CMR 42.00

This certificate supersedes all previous Massachusetts certificates issued to this laboratory. The laboratory is regulated by and shall be responsible for being in compliance with Massachusetts regulations at 310 CMR 42.00.

This certificate is valid only when accompanied by the latest dated Certified Parameter List as issued by the Massachusetts D.E.P. Contact the Division of Environmental Laboratory Sciences to verify the current certification status of the laboratory.

Certification is no guarantee of the validity of the data. This certification is subject to unannounced laboratory inspections.

A handwritten signature in dark ink, appearing to read "Oscar C. Pascual".

Director, Division of Environmental Laboratory Sciences

Issued: 01 JUL 2019

Expires: 30 JUN 2020

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certified Parameter List as of: 02 AUG 2019

M-NH906 ENTHALPY ANALYTICAL, LLC
HAMPTON NH

| NON POTABLE WATER (CHEMISTRY) | Effective Date | 02 AUG 2019 | Expiration Date | 30 JUN 2020 |
|-------------------------------|-------------------|-------------|--------------------|-------------|
| <u>Analytes</u> | | | <u>Methods</u> | |
| ALUMINUM | | | EPA 200.8 | |
| ANTIMONY | | | EPA 200.8 | |
| ARSENIC | | | EPA 200.8 | |
| BERYLLIUM | | | EPA 200.8 | |
| CADMIUM | | | EPA 200.8 | |
| CHROMIUM | | | EPA 200.8 | |
| COBALT | | | EPA 200.8 | |
| COPPER | | | EPA 200.8 | |
| IRON | | | EPA 200.8 | |
| LEAD | | | EPA 200.8 | |
| MANGANESE | | | EPA 200.8 | |
| MERCURY | | | EPA 245.7 | |
| MOLYBDENUM | | | EPA 200.8 | |
| NICKEL | | | EPA 200.8 | |
| SELENIUM | | | EPA 200.8 | |
| SILVER | | | EPA 200.8 | |
| THALLIUM | | | EPA 200.8 | |
| VANADIUM | | | EPA 200.8 | |
| ZINC | | | EPA 200.8 | |
| PH | | | SM 4500-H-B | |
| SPECIFIC CONDUCTIVITY | | | SM 2510B | |
| TOTAL DISSOLVED SOLIDS | | | SM 2540C | |
| ALKALINITY, TOTAL | | | EPA 310.2 | |
| CHLORIDE | | | EPA 300.0 | |
| SULFATE | | | EPA 300.0 | |
| AMMONIA-N | | | SM 4500-NH3-B, G | |
| NITRATE-N | | | SM 4500-NO3-F | |
| KJELDAHL-N | | | SM 4500-NH3-B, G | |
| ORTHOPHOSPHATE | | | SM 4500-P-E | |
| PHOSPHORUS, TOTAL | | | SM 4500-P-B,E | |
| BIOCHEMICAL OXYGEN DEMAND | | | SM 5210B | |
| NON-FILTERABLE RESIDUE | | | SM 2540D | |
| OIL AND GREASE | | | EPA 1664 | |

August 2, 2019

*= Provisional Certification

Page 1 of 1

ACUTE BIOASSAY DATA SUMMARY

ACUTE BIOASSAY DATA SUMMARY

| | | | | | | | | | | | | | | | | | | | |
|--|-----|------------------------------------|----|--|-----------|-----|-----|---------|------|--------|-----------|-------|------|----------------|-------|----------------|----|----|----|
| STUDY: 32699 | | Brine Shrimp: A-5543 | | "AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES | | | | | | | | | | | | | | | |
| CLIENT: Woodard & Curran | | TEST ORGANISM: <i>M. beryllina</i> | | T. Metals | | TOC | AMM | TS/TSS | pH | S/C | SALINITY | | TRC | | | | | | |
| SAMPLE: Hull WWTF Effluent | | ORGANISM SUPPLIER / BATCH / AGE: | | EFF | | 002 | | 003 | 004 | 005000 | 6.83 | 1066 | 64 | 40.02 | | | | | |
| DILUENT: Receiving Water | | See Organism Culture Sheet | | DIL | | | | 009 | 010 | 011012 | 7.78 | 45500 | 30.9 | 40.02 | | | | | |
| SALINITY ADJUSTMENT RECORD: 4000 ML EFFLUENT + 800 G SEA SALTS (A-5509) = 100% ACTUAL PERCENTAGE | | | | | | | | | | | | | | | | | | | |
| 8000 ML DILUENT + 1500 ML DI H ₂ O = 84% ACTUAL PERCENTAGE | | | | | | | | | | | | | | | | | | | |
| CONC | REP | SURVIVAL | | | DO (mg/L) | | | pH (SU) | | | TEMP (°C) | | | S/C (µmhos/cm) | | SALINITY (ppt) | | | |
| | | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 | | | |
| LAB SALT | A | 10 | 9 | 9 | 7.3 | 5.6 | 6.0 | 7.90 | 7.61 | 7.69 | 23 | 23 | 23 | 37000 | 38800 | 39100 | 25 | 26 | 26 |
| | B | 10 | 10 | 10 | 7.3 | 5.5 | 6.0 | | | | | | | | | | | | |
| | C | 10 | 10 | 9 | 7.3 | 5.4 | 5.6 | | | | | | | | | | | | |
| | D | 10 | 10 | 9 | 7.3 | 5.2 | 5.9 | | | | | | | | | | | | |
| RW | A | 10 | 10 | 8 | 8.6 | 5.9 | 6.0 | 7.90 | 7.69 | 7.70 | 23 | 23 | 23 | 38000 | 39200 | 39600 | 25 | 26 | 26 |
| | B | 10 | 10 | 9 | 8.6 | 5.8 | 6.1 | | | | | | | | | | | | |
| | C | 10 | 10 | 10 | 8.6 | 5.6 | 6.1 | | | | | | | | | | | | |
| | D | 10 | 10 | 10 | 8.6 | 5.5 | 5.8 | | | | | | | | | | | | |
| 6.25% | A | 10 | 10 | 9 | 8.2 | 5.7 | 5.9 | 7.90 | 7.68 | 7.71 | 23 | 23 | 23 | 37700 | 39200 | 39600 | 25 | 26 | 26 |
| | B | 10 | 10 | 10 | 8.2 | 5.6 | 5.9 | | | | | | | | | | | | |
| | C | 10 | 10 | 10 | 8.2 | 5.6 | 5.9 | | | | | | | | | | | | |
| | D | 10 | 10 | 10 | 8.2 | 5.6 | 5.8 | | | | | | | | | | | | |
| 12.5% | A | 10 | 10 | 9 | 8.2 | 5.6 | 5.9 | 7.89 | 7.69 | 7.73 | 23 | 23 | 23 | 37700 | 39100 | 39500 | 25 | 26 | 26 |
| | B | 10 | 10 | 9 | 8.2 | 5.5 | 5.9 | | | | | | | | | | | | |
| | C | 10 | 10 | 10 | 8.2 | 5.7 | 6.0 | | | | | | | | | | | | |
| | D | 10 | 10 | 9 | 8.2 | 5.8 | 5.9 | | | | | | | | | | | | |

510 HED 2.7.20 neglected to note starting time; however time was absolutely within station calibration time

| INC TEMP (°C) | 26 | 26 | 26 |
|---------------|----------|----------|-------|
| DATE | 02/01/20 | 02/07/20 | 02/08 |
| TIME | 1235 | 1400 | 1155 |
| INITIALS | DC | CA | CA |

ACUTE BIOASSAY DATA SUMMARY

| | | | |
|----------------------------|--|------------------------------------|--|
| STUDY: 32699 | | Brine Shrimp: A- 5543 | |
| CLIENT: Woodard & Curran | | TEST ORGANISM: <i>M. beryllina</i> | |
| SAMPLE: Hull WWTF Effluent | | ORGANISM SUPPLIER / BATCH / AGE: | |
| DILUENT: Receiving Water | | See Organism Culture Sheet | |

| CONC | REP | SURVIVAL | | | DO (mg/L) | | | pH (SU) | | | TEMP (°C) | | | S/C (µmhos/cm) | | | SALINITY (ppt) | | |
|------|-----|----------|----|----|-----------|-----|-----|---------|------|------|-----------|----|----|----------------|-------|-------|----------------|----|----|
| | | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 | 0 | 24 | 48 | | | |
| 25% | A | 10 | 10 | 10 | 8.5 | 5.6 | 6.1 | 7.87 | 7.71 | 7.74 | 23 | 23 | 23 | 37700 | 39400 | 39800 | 25 | 26 | 27 |
| | B | 10 | 10 | 10 | 8.5 | 5.2 | 5.4 | | | | | | | | | | | | |
| | C | 10 | 10 | 10 | 8.5 | 5.8 | 6.2 | | | | | | | | | | | | |
| | D | 10 | 10 | 10 | 8.5 | 5.8 | 6.2 | | | | | | | | | | | | |
| 50% | A | 10 | 10 | 10 | 8.4 | 5.4 | 6.1 | 7.84 | 7.71 | 7.75 | 23 | 23 | 23 | 37500 | 39300 | 39700 | 25 | 26 | 27 |
| | B | 10 | 10 | 10 | 8.4 | 5.3 | 6.1 | | | | | | | | | | | | |
| | C | 10 | 10 | 10 | 8.4 | 5.2 | 6.0 | | | | | | | | | | | | |
| | D | 10 | 10 | 10 | 8.4 | 5.5 | 6.1 | | | | | | | | | | | | |
| 100% | A | 10 | 10 | 10 | 8.7 | 5.3 | 6.0 | 7.77 | 7.75 | 7.81 | 23 | 23 | 23 | 37300 | 39300 | 40200 | 25 | 26 | 27 |
| | B | 10 | 10 | 10 | 8.7 | 5.5 | 6.0 | | | | | | | | | | | | |
| | C | 10 | 10 | 10 | 8.7 | 5.2 | 5.9 | | | | | | | | | | | | |
| | D | 10 | 10 | 9 | 8.7 | 5.2 | 6.0 | | | | | | | | | | | | |

| | | | |
|---------------|----------|-------|-------|
| INC TEMP (°C) | 26 | 26 | 26 |
| DATE | 02/07/20 | 02/07 | 02/08 |
| TIME | 1235 | 1400 | 1155 |
| INITIALS | DB | CA | CA |

(E10) HED 2.7.20 neglected to note starting time however time was absolutely within station calibration time

STANDARD REFERENCE TOXICANT ANALYSIS

Exposure: Acute - 48 Hours

Species: *Menidia beryllina*

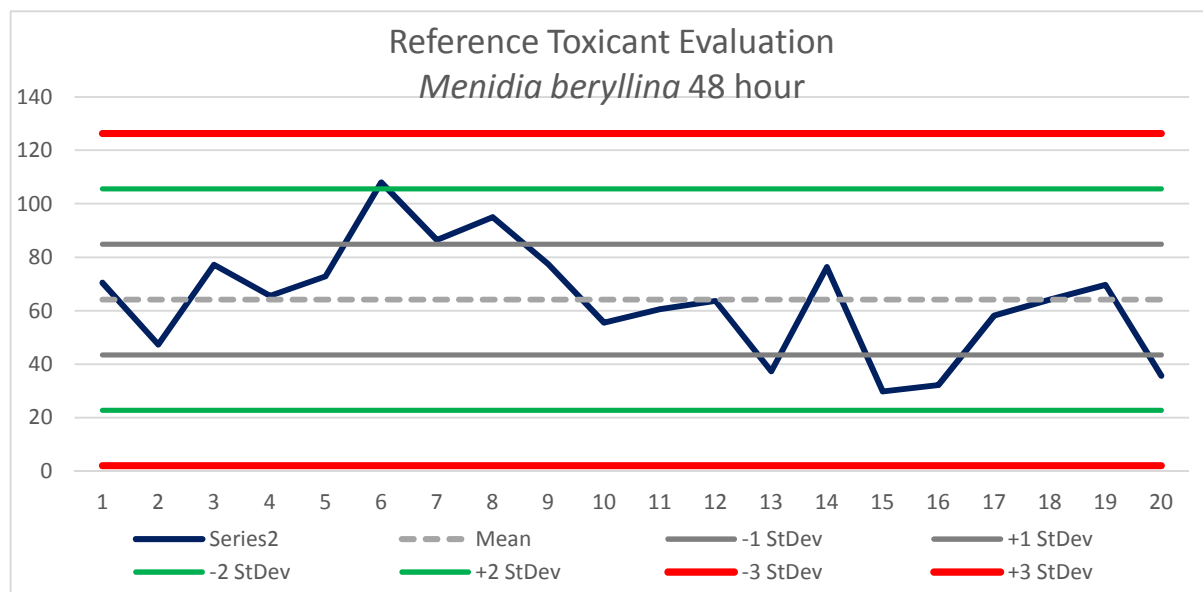
Toxicant: Ammonium Chloride

Temperature: 25C

Long Term Mean: 64.18 mg/L

Long Term CV: 32%

| Date | LC-50 | Mean | Std | 2 Std | CV | Mean | Mean | Mean | Mean | Mean | Mean |
|------------|-------|------|-------|-------|-------|--------|--------|--------|--------|--------|-------------|
| | | | Dev | Dev | | -1 Std | +1 Std | -2 Std | +2 Std | -3 Std | +3 Std |
| 5/10/2018 | 1 | 70.5 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 5/15/2018 | | 47.4 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 5/18/2018 | | 77.2 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 5/23/2018 | | 65.6 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 10/31/2018 | 5 | 72.9 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 4/11/2019 | | 108 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 4/16/2019 | | 86.5 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 4/18/2019 | | 95 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 5/7/2019 | | 77.4 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 6/20/2019 | 10 | 55.5 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 7/31/2019 | | 60.6 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 8/20/2019 | | 63.7 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 9/24/2019 | | 37.3 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 10/1/2019 | | 76.3 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 11/5/2019 | 15 | 29.8 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 12/3/2019 | | 32.2 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 12/27/2019 | | 58.2 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 1/28/2020 | | 64.1 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 2/20/2020 | | 69.7 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |
| 2/27/2020 | 20 | 35.7 | 64.18 | 20.71 | 41.43 | 32.27 | 43.47 | 84.89 | 22.75 | 105.61 | 2.04 126.32 |



Issued By:

Reviewed By:

Hull WPCF Effluent Biomonitoring Program, January 2020.
Study Number 32666.

Data Appendix Page 6

Organism Lot #: 08MbARO020320

TASK: Wet Weight Data - Balance Output File

BALANCE: Ohaus Discovery Balance Model DV215CD

Serial #: 1124024313

Date / Initials: 02/06/20 LAG

| | |
|-----|---------|
| Rep | 0.00229 |
| 1 | 0.00191 |
| 2 | 0.00378 |
| 3 | 0.0073 |
| 4 | 0.00289 |
| 5 | 0.00475 |
| 6 | 0.00525 |
| 7 | 0.00404 |
| 8 | 0.00331 |
| 9 | 0.00335 |
| 10 | 0.00206 |
| 11 | 0.0021 |
| 12 | 0.00209 |
| 13 | 0.00203 |
| 14 | 0.00231 |
| 15 | 0.00247 |
| 16 | 0.00194 |
| 17 | 0.00166 |
| 18 | 0.00209 |
| 19 | 0.0018 |
| 20 | 0.00183 |

Mean Weight (g): 0.00295

Test Volume (L): 0.2

Loading Rate(g/L): 0.14740



Aquatic Research Organisms

DATA SHEET

USMb ARO0203

I. Organism History

Species Menidia berglinga

Source: Lab reared ☒ Hatchery reared _____ Field collected _____

Hatch date 01/26/20 Receipt date _____

Lot number 012620MB Strain ARO

Brood origination Cape Cod MA

II. Water Quality

Temperature 25 °C Salinity 25 ppt D.O. 5.97 ppm

pH 8.2 su Hardness _____ ppm Alkalinity _____ ppm

III. Culture Conditions

Freshwater _____ Saltwater ☒ Other _____

Recirculating ☒ Flow through _____ Static renewal _____

DIET: Flake food ☒ Phytoplankton _____ Trout chow _____

Artemia ☒ Rotifers ☒ YCT _____ Other _____

Prophylactic treatments: _____

Comments: _____

IV. Shipping Information

Client: ESTI # of Organisms 2000+

Carrier: PICK UP Date shipped 02/03/2020

Biologist: Stan J. Kubi

PO BOX 1271 HAMPTON NH 03843-1271 (603) 926-1650 AROFISH@AOL.COM

RECORD OF METERS USED

| | | | |
|-------------------------|--------------|--|-------------|
| STUDY: 32699 | | CLIENT: Woodward & Curran - Hull, MA WWTF | |
| Exposure (Hours) | | | |
| | 0 | 24 | 48 |
| Water Quality Station # | 1 | 2 | 1 |
| Initials / Date | LAG 02/06/20 | HEP 02/07/20 | CA 02/05/20 |

| Water Quality Station #1 | Water Quality Station #2 | COMMENTS |
|--------------------------|--------------------------|----------|
| DO meter # M101 | DO meter # M102 | |
| DO probe # 96 | DO probe # 160 | |
| pH meter # M101 | pH meter # M102 | |
| pH probe # 168 | pH probe # 169 | |
| S/C meter # M101 | S/C meter # M102 | |
| S/C probe # 159 | S/C probe # 1 | |
| Salinity meter # M101 | Salinity meter # M102 | |

PREPARATION OF DILUTIONS

| | | |
|-------------------------------------|---|--------------------------|
| Diluent: Receiving Water (RW) | Day: 0 | E ₀ = 24.1 °C |
| | Sample: E ₀ , U ₀ | U ₀ = 24.2 °C |
| Concentration % | Vol. Eff. (mls) | Final Vol. (mls) |
| Lab Salt | 0 | 800 |
| RW | 0 | ↓ |
| 6.25% | 50 | |
| 12.5% | 100 | |
| 25% | 200 | |
| 50% | 400 | |
| 100% | 800 | |
| INITIALS: | MS | |
| TIME: | 0855 | |
| DATE: | 02/06/20 | |

Report No: 32699 SDG:
Project: Hull

Sample ID: Effluent Start
Matrix: Water
Sampled: 02/05/20 0800

| Parameter | | Result | Quant Limit | Units | Date Prepared | Date of Analysis | INIT/Method/Reference |
|------------------------|-----------|--------|-------------|-----------|---------------|------------------|-----------------------|
| Total solids | 32699-006 | 6700 | 100 | mg/L | 02/07/20 0926 | 02/12/20 1315 | CA /SM 2540B |
| Total suspended solids | 32699-005 | 4.5 | 1 | mg/L | 02/12/20 0955 | 02/18/20 1042 | CA /SM 2540D |
| Total organic carbon | 32699-003 | 9.3 | 0.4 | mg/L | 02/13/20 1300 | 02/13/20 1330 | AS /SM 5310 B |
| Ammonia-N | 32699-004 | 1.36 | 0.1 | mg/L as N | 02/11/20 1432 | 02/11/20 1432 | AS /SM 4500-NH3 G |
| Aluminum, total | 32699-002 | 0.02 | 0.02 | mg/L | 02/24/20 0930 | 02/26/20 0117 | JLH/EPA 200.8 |
| Cadmium, total | 32699-002 | ND | 0.0003 | mg/L | 02/24/20 0930 | 02/26/20 0117 | JLH/EPA 200.8 |
| Calcium, total | 32699-002 | 108 | 0.1 | mg/L | 02/24/20 0930 | 02/26/20 0117 | JLH/EPA 200.8 |
| Chromium, total | 32699-002 | ND | 0.001 | mg/L | 02/24/20 0930 | 02/26/20 0117 | JLH/EPA 200.8 |
| Copper, total | 32699-002 | 0.015 | 0.0005 | mg/L | 02/24/20 0930 | 02/26/20 0117 | JLH/EPA 200.8 |
| Lead, total | 32699-002 | ND | 0.0003 | mg/L | 02/24/20 0930 | 02/26/20 0117 | JLH/EPA 200.8 |
| Magnesium, total | 32699-002 | 235 | 0.1 | mg/L | 02/24/20 0930 | 02/26/20 0117 | JLH/EPA 200.8 |
| Nickel, total | 32699-002 | 0.0034 | 0.001 | mg/L | 02/24/20 0930 | 02/26/20 0117 | JLH/EPA 200.8 |
| Zinc, total | 32699-002 | 0.1 | 0.002 | mg/L | 02/24/20 0930 | 02/26/20 0117 | JLH/EPA 200.8 |

Sample ID: Receiving Water Start
Matrix: Water
Sampled: 02/05/20 0600

| Parameter | | Result | Quant Limit | Units | Date Prepared | Date of Analysis | INIT/Method/Reference |
|------------------------|-----------|--------|-------------|-----------|---------------|------------------|-----------------------|
| Total solids | 32699-012 | 34000 | 100 | mg/L | 02/07/20 0926 | 02/12/20 1315 | CA /SM 2540B |
| Total suspended solids | 32699-011 | 11 | 1 | mg/L | 02/12/20 0955 | 02/18/20 1042 | CA /SM 2540D |
| Total organic carbon | 32699-009 | 1.4 | 1 | mg/L | 02/13/20 1300 | 02/13/20 1330 | AS /SM 5310 B |
| Ammonia-N | 32699-010 | 0.16 | 0.1 | mg/L as N | 02/11/20 1437 | 02/11/20 1437 | AS /SM 4500-NH3 G |
| Aluminum, total | 32699-008 | 0.022 | 0.02 | mg/L | 02/24/20 0930 | 02/26/20 0649 | JLH/EPA 200.8 |
| Cadmium, total | 32699-008 | ND | 0.0005 | mg/L | 02/24/20 0930 | 02/26/20 0649 | JLH/EPA 200.8 |
| Calcium, total | 32699-008 | 403 | 0.2 | mg/L | 02/24/20 0930 | 02/26/20 0649 | JLH/EPA 200.8 |
| Chromium, total | 32699-008 | ND | 0.002 | mg/L | 02/24/20 0930 | 02/26/20 0649 | JLH/EPA 200.8 |
| Copper, total | 32699-008 | 0.0019 | 0.0005 | mg/L | 02/24/20 0930 | 02/26/20 0649 | JLH/EPA 200.8 |
| Lead, total | 32699-008 | ND | 0.0005 | mg/L | 02/24/20 0930 | 02/26/20 0649 | JLH/EPA 200.8 |
| Magnesium, total | 32699-008 | 1200 | 0.2 | mg/L | 02/24/20 0930 | 02/26/20 0649 | JLH/EPA 200.8 |
| Nickel, total | 32699-008 | ND | 0.002 | mg/L | 02/24/20 0930 | 02/26/20 0649 | JLH/EPA 200.8 |
| Zinc, total | 32699-008 | 0.007 | 0.002 | mg/L | 02/24/20 0930 | 02/26/20 0649 | JLH/EPA 200.8 |

Notes:

ND = Not Detected

SAMPLE RECEIPT AND CONDITION DOCUMENTATION

Page 1 of 1

STUDY NO: 32699
 SDG No:
 Project: Hull
 Delivered via: EA
 Date and Time Received: 02/05/20 1100 Date and Time Logged into Lab: 02/05/20 1400
 Received By: RS Logged into Lab by: LAG LAG
 Air bill / Way bill: No Air bill included in folder if received? NA
 Cooler on ice/packs: Yes Custody Seals present? NA
 Cooler Blank Temp (C) at arrival: 4.8 Custody Seals intact? NA
 Number of COC Pages: 1
 COC Serial Number(s): A1018394
 COC Complete: Yes Does the info on the COC match the samples? Yes
 Sampled Date: Yes Were samples received within holding time? Yes
 Field ID complete: Yes Were all samples properly labeled? Yes
 Sampled Time: Yes Were proper sample containers used? Yes
 Analysis request: Yes Were samples received intact? (none broken or leaking) Yes
 COC Signed and dated: Yes Were sample volumes sufficient for requested analysis? Yes
 Were all samples received? Yes Were VOC vials free of headspace? NA
 Client notification/authorization: Not required pH Test strip ID number: A-5827

| Field ID | Lab ID | Mx | Analysis Requested | Bottle | Req'd Pres'n | Verified Pres'n |
|-----------------------|-----------|----|--|----------|--------------|-----------------|
| Effluent Start | 32699-001 | W | MB48AD StartSample | 1x3750 P | 4 C | Yes |
| Effluent Start | 32699-002 | W | Total Metals Cd,Cr,Ni,Pb,Cu,Zn,Al,Ca,Mg; | 250 P | HNO3 | Yes |
| Effluent Start | 32699-003 | W | TOC | 1x40 G | H3PO4 | Yes |
| Effluent Start | 32699-004 | W | NH3; | 125 P | H2SO4 | Yes |
| Effluent Start | 32699-005 | W | TSS | 1000 P | 4 C | Yes |
| Effluent Start | 32699-006 | W | TS | 250 P | 4 C | Yes |
| Receiving Water Start | 32699-007 | W | MB48AD StartDiluent | 2x3750 P | 4 C | Yes |
| Receiving Water Start | 32699-008 | W | Total Metals Cd,Cr,Ni,Pb,Cu,Zn,Al,Ca,Mg; | 250 P | HNO3 | Yes |
| Receiving Water Start | 32699-009 | W | TOC | 1x40 G | H3PO4 | Yes |
| Receiving Water Start | 32699-010 | W | NH3; | 125 P | H2SO4 | Yes |
| Receiving Water Start | 32699-011 | W | TSS | 1000 P | 4 C | Yes |
| Receiving Water Start | 32699-012 | W | TS | 250 P | 4 C | Yes |

Notes and qualifications:

See COC

CHAIN OF CUSTODY DOCUMENTATION

| | | | | | |
|-------------|---------------------------|----------|-----------------------|------------------|------------------|
| Client: | Woodard and Curran - Hull | Contact: | Aram Varjabedian | Project Name: | Hull WWTF |
| Report to: | Aram Varjabedian | Address: | 1111 Nantasket Avenue | Project Number: | P0036 |
| Invoice to: | Aram Varjabedian | Address: | Hull, MA 02045 | Project Manager: | Aram Varjabedian |
| Voice: | 781-925-0906 | Fax: | 781-925-3056 | email: | 0 |
| | | | | P.O.: | |

| Lab Number (assigned by lab) | Your Field ID: (must agree with container) | Date Sampled | Time Sampled | Sampled By | Grab or com- posite (G/C) | No | Container Size (mL) | Type (P/G/T) | Field Preser- vation | Matrix S=Solid W=Water | Filter N=Not needed F=Done in field L=Lab to do | Analyses Requested/ Special Instructions: |
|---------------------------------|---|-----------------|-----------------|---------------|------------------------------------|----|---------------------------|-----------------|----------------------------|------------------------------|--|--|
| 001 | Effluent Start | 2/4-5/20 | 8A-8A | JB | C | 1 | 3750 | P | 4 C | Water | N | MB48AD StartSample |
| 002 | Effluent Start | 2/4-5/20 | 8A-8A | JB | C | 1 | 250 | P | HNO3 | Water | N | Total Metals Cd,Cr,Ni,Pb,Cu,Zn,Al,Ca,Mg; |
| 003 | Effluent Start | 2/4-5/20 | 8A-8A | JB | C | 1 | 40 | G | 4 C | Water | N | TOC |
| 004 | Effluent Start | 2/4-5/20 | 8A-8A | JB | C | 1 | 125 | P | H2SO4 | Water | N | NH3; |
| 005 | Effluent Start | 2/4-5/20 | 8A-8A | JB | C | 1 | 1000 | P | 4 C | Water | N | TSS |
| 006 | Effluent Start | 2/4-5/20 | 8A-8A | JB | C | 1 | 250 | P | 4 C | Water | N | TS |
| 007 | Receiving Water Start | 2/5/20 | 6AM | JB | G | 2 | 3750 | P | 4 C | Water | N | MB48AD StartDiluent |
| 008 | Receiving Water Start | 2/5/20 | 6AM | JB | G | 1 | 250 | P | HNO3 | Water | N | Total Metals Cd,Cr,Ni,Pb,Cu,Zn,Al,Ca,Mg; |
| 009 | Receiving Water Start | 2/5/20 | 6AM | JB | G | 1 | 40 | G | 4 C | Water | N | TOC |
| 010 | Receiving Water Start | 2/5/20 | 6AM | JB | G | 1 | 125 | P | H2SO4 | Water | N | NH3; |
| 011 | Receiving Water Start | 2/5/20 | 6AM | JB | G | 1 | 1000 | P | 4 C | Water | N | TSS |
| 012 | Receiving Water Start | 2/5/20 | 6AM | JB | G | 1 | 250 | P | 4 C | Water | N | TS |

| | | | | | | | | | | | | | |
|------------------|--------------------|-------|--------|-------|---------|---------------------|--------------------|-------|--------|-------|-------|-----------|-------|
| Relinquished By: | <i>[Signature]</i> | Date: | 2/5/20 | Time: | 9:50 AM | Received By: | <i>[Signature]</i> | Date: | 2/5/20 | Time: | 11:00 | Temp (C): | 4.8°C |
| Relinquished By: | <i>[Signature]</i> | Date: | 2/5/20 | Time: | 12:40 | Received at Lab By: | <i>[Signature]</i> | Date: | 2/5/20 | Time: | 12:40 | Temp (C): | 4.8°C |
| Comments: | | | | | | | | | | | | | |

Assay Review Checklist

DATE IN: 02/05/20
DATE DUE: 03/31/20

STUDY#: 32609
CLIENT: Woodward Clyde
PROJECT: Hull L&TF
ASSAY: MB48AD

| Project Paperwork Check for Completeness | | | | |
|--|----------|---------|------------|----------|
| | Date | Analyst | Supervisor | Comments |
| Day 0 | 02/05/20 | BG | BG | |
| Day 1 | 02/07/20 | HED | BG | |
| Day 2 | 02/08 | CA | BG | |
| Day 3 | | | | |
| Day 4 | | | | |
| Day 5 | | | | |
| Day 6 | | | | |
| Day 7 | | | | |
| Day 8 | | | | |

| Analyst Data Review | Date | Initials | Comments |
|--|----------|----------|----------|
| Chains of Custody Complete | 02/09/20 | LAG | |
| Sample Receipt Complete | 02/09 | | |
| Organism Culture Sheet(s) | | | |
| Bench Sheets Complete (dates, times, initials, etc...) | | | |
| Water Quality Data Complete | | | |
| TRC Values & Bottle Numbers | | | |
| Daphnid Calculations Complete | NA | NA | |
| Weights Reported | 02/09/20 | LAG | |
| Assay Acceptability Review | L | L | |

| Technical Report Review | Date | Initials | Comments |
|----------------------------------|---------|----------|----------|
| Statistical Analysis Complete | NA | | |
| Statistical Analysis Reviewed | ↓ | | |
| Data Acceptability Review | 2/20/20 | MW | |
| Supporting Chemistry Report | | | |
| Draft Report | 2/20/20 | MW | |
| QA Audit/Review Complete | | | |
| Final Report Reviewed | 3/19/20 | WR | |
| Final Report Printed - PDF | | | |
| Executive Summary / Chems Sent | | | |
| Report E-mailed / Faxed | | | |
| Report Logged Out / Invoice Sent | | | |
| Report Scanned to Archive | | | |

Q:\Forms\Lab Forms\Archive and stuff that belongs in folder\Assay Review Checklist 06-13-19 Update.wpd